

Pro/antioxidant effect of non- and proteinogenic amino acids on $\text{Cu}^{2+}(\text{Fe}^{2+})$ -mediated fragmentation of phosphatidylglycerol

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In the polar moieties of glycerophospholipids the reaction of free radical fragmentation, proceeding through $\text{H}_2\text{C}(\text{Y})-\text{C}(\text{OH})-\text{H}_2\text{C}-\text{OP}(\text{O})\text{O}_2\text{R}^-$ radicals formation, can occur [1]. The fragmentation leads to the rupture of the phosphoester bond in lipid molecules and the formation of phosphatidic acid. Amino acids (AA) play an important role in the regulation of various signaling pathways, oxidative stress, apoptosis, and autophagy in biosystems. The aim of this work was to study the effect of non- and proteinogenic AA on $\text{Fe}^{2+}(\text{Cu}^{2+})$ -mediated fragmentation of dimyristoylphosphatidylglycerol (DMPG) with the formation of dimyristoylphosphatidic acid (DMPA). Preliminarily, before studies in liposomal membranes, photometric monitoring of the ability of β -alanine, taurine, hypotaurine, α -alanine, histidine, glycine, methionine (in a wide concentration range of 0.05-20 mM and in the presence of various biologically active substances) to regulate the fragmentation of $\text{H}_2\text{C}(\text{OH})-\text{C}(\text{OH})-\text{H}_2\text{C}-\text{OP}(\text{O})\text{O}_2\text{H}^-$ and $\text{H}_2\text{C}(\text{OH})-\text{HC}(\text{OP}(\text{O})\text{O}_2\text{H}^-)-\text{C}(\text{H})(\text{OH})\{\text{HC}(\text{OH})-\text{HC}(\text{OP}(\text{O})\text{O}_2\text{H}^-)-\text{CH}_2(\text{OH})\}$ radicals was carried out. It has been found that, in the presence of $\text{Fe}^{2+}(\text{Cu}^{2+})$ ions, the effect of the studied AAs on the fragmentation of phospho-derivatives of glycerol with the rupture of phosphoester bond can be neutral, pro/antioxidant, or inversed. So, in the presence of Cu^{2+} , β -Ala in large amounts (AA: Cu^{2+} >10:1) has an activating effect, which decreases in the presence of effective HO^\cdot -acceptors (Figure). This may be the mechanism of action of β -Ala in the development of oxidative stress and apoptosis observed in mitochondria containing diphosphatidylglycerol [2].

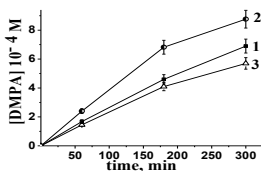


Fig. DMPA accumulation in DMPG-liposomes (20 mM) incubated with $\text{CuSO}_4-\text{H}_2\text{O}_2$ (0.1/0 mM) at 37 ° C, 1 - without additives; in the presence of 2 mM β -Ala: 2 - alone, 3 - mixed with 1 mM NaN_3

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References

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